

Express Mail Label

PATENT APPLICATION
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DATA CAPTURE APPARATUS WITH
HANDWRITTEN DATA RECEIVING COMPONENT

SPECIFICATION

AUTHORIZATION PURSUANT TO 37 C.F.R. 1.71(d)(e)

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CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a continuation-in-part of the following co-pending applications:

| <u>Ser. No.</u> | <u>Filing Date</u> | <u>Inventor(s)</u> | <u>Attorney Docket No.</u> |
|-----------------|--------------------|---------------------------|--------------------------------|
| 07/415,169 | 09-29-89 | D. Hacker J. Walter | 6943 |
| 07/451,322 | 12-15-89 | A. Danielson D. Durbin | 5769Y |

The foregoing co-pending applications refer to the following earlier applications pursuant to 35 U.S.C. 120, and reference is hereby made to these earlier applications herein in accordance

1 with the provisions of 35 U.S.C. 120:

| 2 | <u>Ser. No.</u> | <u>Filing Date</u> | <u>Inventor(s)</u> | <u>Attorney Docket No.</u> |
|---|-----------------|--------------------|--------------------|--------------------------------|
| 3 | 07/143,921 | 01-14-88 | A. Danielson | 5769X |
| 4 | (now abandoned) | | D. Durbin | |
| 5 | 06/897,547 | 08-15-86 | D. Durbin | 5769 |
| 6 | (now abandoned) | | R. Lo | |
| 7 | | | G. Welsch | |
| | | | S. Kelly | |

8 Each of the foregoing listed co-pending and earlier
9 applications is hereby incorporated herein by reference in its
10 entirety including drawings and appendices.

12 BACKGROUND OF THE INVENTION

13 Hand-held data terminals or computers are commercially
14 available for use in a variety of applications, including the
15 distribution and control of products distributed by a route sales
16 person. These hand-held data terminals provide the route sales
17 person with the latest product and customer information as well
18 as information regarding the inventory of the products being
19 distributed. As products are distributed to the customer and
20 other products picked up for return, this information is entered
21 into the terminal together with payment or pricing information.
22 Thus, these hand-held data terminals are useful in many
23 application for order entry, inventory control and route
24 accounting in any industry where a product is being distributed.

25 Although these hand-held data terminals as a part of a
26 distribution system have greatly increased the accuracy and
27 efficiency of product distribution, there are situations where it

1 is desirable to allow the capture and recording of handwritten
2 data rather than data that is entered by keystrokes. One such
3 use would be to provide for the recording of signatures and for
4 verification of the signatures recorded. In some applications,
5 digitized pads are available to permit the entry of handwritten
6 data, usually in situations where the data is entered by marking
7 a predetermined location on a form that overlies the pad.
8 However, to date there does not appear to be available any means
9 for combining a handwritten data entry module with a portable
10 data terminal in such a way that the handwritten data can be
11 directly entered or read and entered by a scanner.

12 SUMMARY OF THE INVENTION

13 The invention provides a means for recording and entering
14 handwritten data in combination with a portable hand-held data
15 terminal. The invention provides a module that is removably
16 attachable to a hand-held computer terminal, which module allows
17 the capture of handwritten data. In a preferred embodiment, the
18 module provides a means for capturing handwritten data which is
19 then read by an optical scanner and entered into the system. In
20 the alternative, the module contains a digitized pad which can
21 capture and enter the handwritten data immediately as it is
22 entered on the pad. The preferred module of the invention is
23 easily and quickly attached to a hand-held computer terminal by a
24 hook-hinge arrangement, using the existing connector on the
25 computer terminal and a connector on the module. In the
26 embodiment of the module using a digitized pad, the module and
27 hand-held terminal provide an integrated system while allowing

1 normal hand-held portable operation with the module in place.

2 BRIEF DESCRIPTION OF THE DRAWINGS

3 Fig. 1 is a perspective view of a hand-held data terminal
4 with the module of the invention in place;

5 Fig. 2 is a front elevational view of the module;

6 Fig. 3 is a sectional view of the module;

7 Fig. 4 is a top view of the module, partly in section;

8 Fig. 5 is a bottom view of the module; and

9 Fig. 6 is a perspective view of another hand-held data
10 terminal with a signature pad module in place;

11 Fig. 7 is a front elevational view of the module;

12 Fig. 8 is a sectional view of the module;

13 Fig. 9 is a top view of the module, partly in section;

14 Fig. 10 is a bottom view of the module;

15 Figs. 11 and 12 show exemplary circuitry for the
16 input/output printed circuit board of the embodiment of Figs. 6-
17 10;

18 Figs. 13-16 show exemplary circuitry for the CPU printed
19 circuit board of the embodiment of Figs. 6-10;

20 Fig. 17 is a partial plan view showing a computerized
21 processor module assembled in a receiving module and operating in
22 signature input mode; and

23 Fig. 18 shows the computerized processor module displaying
24 the results of a signature verification operation for the case
25 where the processor module functions as a separate self-contained
26 unit using its own battery power.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

Referring first to Fig. 1 of the drawing, there is illustrated a hand-held data terminal or computer terminal 10 of a type suitable for use with the module of the invention. A computer terminal such as the Model NT141GL hand-held computer terminal of Norand Corporation, Cedar Rapids, Iowa, has the necessary power and flexibility for this application. The computer terminal 10 has a keyboard 12 and a display 14. In addition to keyboard entry, data can be downloaded to the computer terminal 10 from a host computer or entered from a peripheral device such as a scanner.

The module providing for the entry of handwritten data is indicated generally by the reference numeral 16 and is shown in more detail in Figs. 2 through 5. The module 16 consists of a suitable case 18 that houses a pad 20 for recording data in the manner described hereinafter. The case 18 has formed along the lower edge near the front a depending hinge 22 having a lug 24 extending along its entire length. Also, along the bottom surface 25 of the module 16 near the rear wall 26 is a cable plug 28 that will engage with a standard receptacle (not shown) on the top surface of the hand-held computer terminal 10. Plug 28 and the receptacle provide a standard 15-pin connection between these components. Near the rear of top surface 32 of module 16 there is provided a suitable 15-pin receptacle 34 that provides for connection of other external devices. The receptacle 34 and plug 28 are suitably interconnected by cable 36 inside of the case 18.

The hinge 22 with its locking lug 24 provided for easy,

1 quick and removable connection of the module 16 to the computer
2 terminal 10. By engaging the locking lug 24 under a
3 corresponding shoulder 38 in the top surface of computer terminal
4 10 and rotating the module 16 rearwardly until the plug 28 on the
5 module 16 engages the receptacle on the computer terminal 10, the
6 module 16 is quickly and solidly affixed to the computer terminal
7 10 and all necessary connections made between plug 28 and
8 receptacle. As will become more evident from the description
9 hereinafter, the force applied by a user to the module 16 by
10 entering handwritten data on the pad 20 will bias the module 16
11 further into a locked position on the computer terminal 10. In
12 order to remove the module 16 from the computer terminal 10, the
13 module 16 is grasped and rotated forwardly in the direction
14 opposite to the force that is applied during use. Thus,
15 connection between the module 16 and computer terminal 10 is a
16 solid, positive connection that is quickly and easily made.

17 The pad 20 can be of any suitable type for recording
18 handwritten data. If a suitable optical scanner (not shown) is
19 to be used as a part of the system, the pad 20 can very simply be
20 any suitable means in which handwritten data can be visibly
21 recorded so that it can be scanned and entered into the system by
22 the scanner. Suitable optical scanners are available for reading
23 handwritten data of all types and processing the information read
24 digitally and entering the digitalized data into the computer
25 terminal 10. A suitable optical scanner for this purpose is
26 described in the United States Patent Application Serial No.
27 07/238,701, filed August 31, 1988, by Steven E. Koenck, (Attorney
28

1 Docket No. 6240), which application has been assigned to Norand
2 Corporation, the same assignee of this application.

3 The pad 20 also may be a digitized pad of any suitable type
4 containing resistive sheets 40 (Fig. 4) responsive to operating
5 pressures in a suitable range normally applied by a user using a
6 ballpoint pen. The digitized pad 20 using resistive sheets 40
7 preferably has sufficiently high resolution to provide an
8 accurate representation of handwritten data including signatures.
9 The resistive sheets 40 are preferably covered with an abrasion
10 resistive cover 42 of a suitable polyester material. When the
11 user enters data onto pad 20 by supplying sufficient pressure
12 with a writing instrument to activate the resistive sheets 40,
13 the information is digitized, compressed, stored and processed by
14 the computer terminal 10. For example, if the module 16 is being
15 used for signature verification, a signature written on pad 20
16 can be immediately verified or stored for future verification.

17 From the foregoing description, it is evident that the
18 module of the invention provides the capability of capturing and
19 recording handwritten data of all types, which data can be
20 entered either directly using a digitizing pad on the module or
21 the handwritten data can be entered into the data terminal by a
22 suitable optical scanner for further processing. All types of
23 handwritten data, including both texts and graphics, can be
24 captured using the module of the invention in connection with a
25 portable hand-held data terminal. One example that has been
26 described is the verification of signatures, but any handwritten
27 data can be entered directly or scanned into the terminal, the
28

1 amount of data being limited by the available memory. The module
2 of the invention thus provides a vehicle for significant data
3 entry means not presently available with hand-held type computer
4 terminals.

5 Description of FIGS. 6 to 10

6 FIGS. 6 to 10 show a signature pad module with dimensions of
7 2.870 inches (length), 1.5000 inches (width) and 2.27 inches
8 (height). Accordingly such a module may be adapted to fit in a
9 pocket size shell configuration to form a self contained portable
10 battery operated system. The following description is considered
11 relevant in explaining further the significance of the graphical
12 input capability of the pocket size systems.

13 While hand-held data terminals have greatly increased the
14 accuracy and efficiency of product distribution, there are
15 situations where it is desirable to allow the capture and
16 recording of handwritten data rather than data that is entered by
17 keystrokes. One such use would be to provide for the recording of
18 signatures and for verification of the signatures recorded. In
19 some applications, digitized pads are available to permit the
20 entry of handwritten data, usually in situations where the data
21 is entered by marking a predetermined location on a form that
22 overlies the pad. However, to date there does not appear to be
23 available any means for combining a handwritten data entry module
24 with a portable data terminal in such a way that the handwritten
25 data can be directly entered or read and entered by a scanner.

26 In an illustrated embodiment, the module contains a
27 digitized pad which can capture and enter the handwritten data

1 immediately as it is entered on the pad. The illustrated module
2 is easily and quickly attached to a hand-held computer terminal
3 by a hook-hinge arrangement, using the existing connector on the
4 computer terminal and a connector on the module. In the
5 embodiment of the module using a digitized pad, the module and
6 hand-held terminal provide an integrated system while allowing
7 normal hand-held portable operation with the module in place.
8 Referring first to FIG. 6 of the drawings, there is illustrated a
9 hand-held data terminal or computer terminal 510 of a type
10 suitable for use with the signature pad module. A computer
11 terminal such as the Model NT141GL hand-held computer terminal of
12 Norand Corporation, Cedar Rapids, Iowa, has the necessary power
13 and flexibility for this application. The computer terminal 510
14 has a keyboard 512 and a display 514. In addition to keyboard
15 entry, data can be downloaded to the computer terminal 510 from a
16 host computer or entered from a peripheral device such as a
17 scanner.

18 The module providing for the entry of handwritten data is
19 indicated generally by the reference numeral 516 and is shown in
20 more detail in FIGS. 7 through 10. The module 516 comprises a
21 suitable case 518 that houses a pad 520 for recording data in the
22 manner described hereinafter. The case 518 has formed along the
23 lower edge near the front a depending hinge 522 having a lug 524
24 extending along its entire length. Also, along the bottom surface
25 525 of the module 516 near the rear wall 526 is a cable plug 528
26 that will engage a standard receptacle (not shown) the top
27 surface of the hand-held computer terminal 510. Plug 528 and the
28

receptacle provide a standard 15-pin connection between these components. Near the top surface 532 of module 516 there is provided a suitable 15-pin receptacle 534 that provides for connection of other external devices. The receptacle 534 and plug 528 are suitably interconnected by means including ground cable 536 inside of the case 518.

The hinge 522 with its locking lug 524 provides for easy, quick and removable connection of the module 516 to the computer terminal 510. By engaging the locking lug 524 under a corresponding shoulder at 538 in the top surface of computer terminal 510 and rotating the module 516 rearwardly until the plug 528 on the module 516 engages the receptacle on the computer terminal 510, the module 516 is quickly and solidly affixed to the computer terminal 510 and all necessary connections made between plug 528 and its mating receptacle. The force applied by a user to the module 516 in entering handwritten data on the pad 520 will bias the module further into a locked position on the computer terminal 510. In order to remove the module 516 from the computer terminal 510, the module 516 is grasped and rotated forwardly in the direction opposite to the force that is applied during use. Thus, connection between the module 516 and computer terminal 510 is a solid, positive connection that is quickly and easily made.

The pad 520 can be of any suitable type for recording handwritten data. If a suitable optical scanner (not shown) is to be used as a part of the system, the pad 520 can very simply be any suitable means in which handwritten data can be visibly

1 recorded so that it can be scanned and entered into the system by
2 the scanner. Suitable optical scanners are available for reading
3 handwritten data of all types and processing the information read
4 digitally and entering the digitized data into the computer
5 terminal 510. A suitable optical scanner for this purpose is
6 described in the United States Patent Application Serial No.
7 07/238,701, filed August 31, 1988, by Steven E. Koenck, (Attorney
8 Docket No. 6240), which application has been assigned to Norand
9 Corporation, the same assignee of this application.

10 The pad 520 also may be a digitizer pad of a any suitable
11 type containing resistive sheets forming a digitizer means 540
12 (FIG. 9) responsive to operating pressures in a suitable range
13 normally applied by a user using a ballpoint pen. The digitized
14 pad 520 using resistive sheets at 540 preferably has sufficiently
15 high resolution to provide an accurate representation of
16 handwritten data including signatures. The resistive sheets at
17 540 are preferably covered with an abrasion resistant cover 542
18 of a suitable polyester material. When the user enters data onto
19 pad 520 by supplying sufficient pressure with a writing
20 instrument to activate the resistive sheets at 540, the
21 information is digitized, compressed and stored and/or
22 transmitted to the computer terminal 510. For example, if the
23 module 516 is being used for signature verification, a signature
24 written on pad 520 can be immediately verified or stored for
25 future verification.

26 From the foregoing description, it is evident that the data
27 capture module provides the capability of capturing and recording

1 handwritten data of all types, which data can be entered either
2 directly using a digitizing pad on the module, or the handwritten
3 data can be entered into the data terminal by a suitable optical
4 scanner for further processing. All types of handwritten data,
5 including both text and graphics, can be captured using the
6 module in connection with a portable hand-held data terminal. One
7 example that has been described is the verification of
8 signatures, but any handwritten data can be entered directly or
9 scanned into the terminal, the amount of data being limited by
10 the available memory. The module thus provides a vehicle for
11 significant data entry means not presently available with hand-
12 held type computer terminals.

13 The actual volume occupied by the signature pad 520 and the
14 printed circuit boards 562 and 570 is about 1 3/4 inch (wide) by
15 3 1/4 inch (long) by about 1 3/8 inch (deep). This is consistent
16 with use with a pocket size receiving module.

17 The pad active area may be 2.375 inches by .875 inch by .055
18 inch. The covering 542 may be .007 inch polyester. The pad may
19 utilize a silicone elastomer pad sensor, and may provide a pad
20 resolution of 175 points per inch giving a resolution of 415
21 points across and at least 150 points in height.

22 Generally the signature pad may comprise upper and lower
23 resistive sheets of silicone elastomer which have resistive ink
24 applied to the confronting faces so as to present uniform
25 resistivity over the surfaces. Application of point pressure to
26 the cover sheet 542 causes the resistive layers to contact at a
27 corresponding point.

1 For tractor fed forms, alignment pegs 563, 564 on the bezel
2 part 518B are used to engage in the form feed holes to hold the
3 form in position during the signature capture process. Should the
4 sensor pad 520 be damaged, the bezel part 518B including the
5 sensor pad can be replaced without replacing the entire unit.
6 This is accomplished by removing screws 553, 554 and pivoting
7 parts 518A, 518B away from each other. The connector 560 can then
8 be unplugged from the input/output printed circuit board 562. The
9 ground cable 536 may be separable at 568.

10 Printed circuit board 570 may carry components such as a CPU
11 chip (e.g. type 80C31), CMOS static RAM (e.g. 32K x 8), and an
12 EPROM component (e.g. type 27C256) as indicated at 571, FIG. 9.

13 The printed circuit boards 562 and 570 are 1 3/8 inch by 3
14 inch by less than 1/16 inch and are separated from each other by
15 about one-half inch. Coupling between the digitizer pad 540 and
16 the circuitry of board 562 may be by means of two twin conductor
17 ribbons such as that indicated at 572, FIG. 9.

18 Referring to FIG. 8, it can be seen that case 518 is formed
19 of a base assembly 518A and a bezel assembly 518B. The base
20 assembly includes an outwardly facing hook plate 550 which
21 interlocks with a receiving recess of the bezel assembly. The
22 parts 518A, 518B are pivotal at the hook plate-recess into a snug
23 interfitting relationship, with edge 551 fitting into a receiving
24 channel of part 518B. The parts are then secured together by
25 means of screws 553, 554, FIG. 23. The channel may have a sealing
26 strip seated therein, e.g. a .052 inch diameter elastomer 12.5
27 inches long.

1 Ribbon connectors 557, 558 from the 15-pin plug 528 and 15-
2 pin receptacle 534 are provided with internal 16 position
3 receptacles 559, 560 which connect with headers on the
4 input/output printed circuit board 562. When the pad is
5 disabled, communications will pass between connectors 528 and 534
6 unmodified.

7 By way of an alternate example, the resistive sheets may be
8 of Mylar of five mils (.005 inch) thickness. In any case,
9 conductive x-axis conductive strips may extend along the long
10 edges of the upper resistive layer, and Y-axis conductive strips
11 may extend along the short edges of the lower resistive layer,
12 the pairs of conductive strips being connected with conductors of
13 respective ribbons such as 572, FIG. 9.

14 Conveniently the outer sheet is somewhat longer in the
15 length and width dimensions so as to overlie a metal frame 573,
16 FIG. 9, while the inner sheet is seated in a recess within the
17 confines of the frame 573. The outer resistive sheet is then
18 fastened at its margins to the frame so that there is normally a
19 clearance air space of approximately ten to thirty mils (one mil
20 equals .001 inch) between the two resistive layers. The
21 confronting resistive surfaces may comprise graphite ink
22 resistive surfaces as is well understood in the art.

23 Description of FIGS. 11 and 12

24 FIGS. 11 and 12 illustrate exemplary circuitry for the
25 input/output printed circuit board 562. FIG. 11 shows the
26 circuitry connected to the X and Y axis conductive strips of the
27 signature pad 520. For reading an X-axis dimension from the

signature pad, transistors 24-Q2, 24-Q5 and 24-Q6 are turned on to apply a potential of five volts analog, (+5A), through transistor 24-Q2 to the Y+ conductor 2410 which leads to the Y axis strip at one end of the inner resistive surface. The return path from the other end of the inner resistive strip is via Y-- conductor 2411 and transistor 24-Q6, creating a potential distribution along the long X-axis dimension of the pad. The X-axis potential value at the point contacting the outer resistive sheet is coupled via conductors 2412 and 2413 to the channel one input of analog to digital converter 24-U1 (e.g. type LTC1091).

Similarly, to read out a Y-axis value, transistors 24-Q3, 24-Q4 and 24-Q1 are turned on, and the Y-axis potential at the contact point is read out via the inner resistive sheet and conductors 2410 and 2414 leading to the channel zero input of the analog to digital converter 24-U1.

In FIG. 12, line 2511 receives battery voltage MBATS from the terminal 10. Line 2511 is coupled with pin 15 of connector 528, via position 15 of receptacle 559, FIG. 21. The I/O printed circuit board 562 connects position 15 of the header receiving receptacle 559 with position 15 of the header for receptacle 560. Line 2511 connects with line 2416, FIG. 11, and connects to the CPU printed circuit board 570 via mating interboard connectors such as 573, 574, FIG. 8, a capacitor (not shown, .01 microfarad, 50 volts), being connected between MBATS and ground in parallel with 25-TZ1.

Applying EXT EN to conductor 2512 serves to transmit a reset signal to the processor of board 570 via 25-Q7, 25-Q10, 25-Q9 and

2513 (RESET).

The signals associated with the various positions of connectors 528 and 534 are as follows:

Connector 528

Connector 534

| | | | | | |
|----|----|-----------|----|----|-----------|
| J1 | 1 | TXD | J2 | 1 | TXD Out |
| J1 | 2 | DTR | J2 | 2 | DTR |
| J1 | 3 | RTS | J2 | 3 | RTS |
| J1 | 4 | RCT | J2 | 4 | RCT |
| J1 | 5 | RXD | J2 | 5 | RXD IN |
| J1 | 6 | CTS | J2 | 6 | CTS |
| J1 | 7 | DSR | J2 | 7 | DSR |
| J1 | 8 | CHG In | J2 | 8 | CHG In |
| J1 | 9 | GND | J2 | 9 | GND |
| J1 | 10 | XOVER/TXL | J2 | 10 | XOVER/TXL |
| J1 | 11 | PROX/RXC | J2 | 11 | PROX/RXC |
| J1 | 12 | SCAN/PWR | J2 | 12 | SCAN/PWR |
| J1 | 13 | EXT EN | J2 | 13 | N.U. |
| J1 | 14 | RCR/CD | J2 | 14 | RCR/CD |
| J1 | 15 | MBATS | J2 | 15 | MBATS |
| J1 | 16 | N.U. | J2 | 16 | N.U. |

The symbols J1 and J2 actually refer to the headers on I/O board 562 receiving connectors 559 and 560, respectively. Thus position 16 is not used. Position 13 of J1 connects with line 2512, position 1 connects with line 2520 and position 5 connects with line 2521. Line 2522 connects with position 5 of J2, and line 2523 connects with position 1 of J2. The printed circuit board 562 provides direct connections between positions of J1 and J2 designated DTR, RTS, RCT, CTS, DSR, RCR/CD, RCT, CHG IN, XOVER/TXL, and PROX/RSC, MBATS and GND.

The transistor 25-Q6 controls supply of power to the pad regulator 25-REG1.

The interboard connectors on board 562 such as 573, FIG. 8,

are designated J3 and J4 carry the following signals.

| | | | | | |
|----|---|-------|----|---|-------|
| J3 | 1 | N.U. | J4 | 1 | ADCS |
| J3 | 2 | DI/O | J4 | 2 | RDX4 |
| J3 | 3 | ADCLK | J4 | 3 | TXD3 |
| J3 | 4 | JY- | J4 | 4 | RESET |
| J3 | 5 | JY+ | J4 | 5 | GND |
| J3 | 6 | JX- | J4 | 6 | +5V |
| J3 | 7 | JX+ | J4 | 7 | MBATS |

Description of FIGS. 13, 14, 15 and 16

FIGS. 13-16 show exemplary circuitry for the CPU board 570. The interboard connectors on board 570 such as connector 574 are designated P3 and P4 and connect with the CPU, 26-U5, of board 570 as indicated in the following table:

CPU (Type 80C31)

| | | | <u>Pin</u> | <u>CPU Pin Designation</u> |
|-------|---|-------|------------|----------------------------|
| P3 | 1 | N.U. | | |
| P3 | 2 | DI/9 | 9 | P 1.7 |
| P3 | 3 | ADCLK | 6 | P 1.4 |
| P3 | 4 | JY- | 5 | P 1.3 |
| P3 | 5 | JY+ | 4 | P 1.2 |
| P3 | 6 | JX- | 3 | P 1.1 |
| P3 | 7 | JX+ | 2 | P 1.0 |
| <hr/> | | | | |
| P4 | 1 | ADCS | 8 | P 1.6 |
| P4 | 3 | TXD3 | 11 | RXD |
| P4 | 4 | RESET | 10 | RST |
| P4 | 5 | GND | 22,35 | VSS,EA |
| PR | 6 | +5V | 44 | VCC |

Pin 13 (TXD) of CPU 26-U5 connects via line 2610 (RXD3) with the circuit of FIG. 14, which in turn drives line 2611 (RXD4). MBATS line 2612 also connects with FIG. 14. Line 2614 connects with the circuit of FIG. 15.

Pins of CPU 26-U5 designated AD7-AD0, respectively connect with data bus 2910, FIG. 16. The pin of 26-U5 designated ALE

1 connects with latch 29-U2 and EPROM 29-U3 via line 2620. Pin 32
2 of 26-U5 ($\overline{\text{PSEN}}$) connects via line 2621 with 29-U3. Address bus
3 2630 from pins designated A8-A15 of 26-U5 connects with
4 components 29-U3 and 29-U4 (a CMOS static random access memory,
5 e.g., 128K x 8).

6 Pin $\overline{\text{RD}}$ of CPU 26-U5 connects via line 2631, pin $\overline{\text{RAMEN}}$
7 connects via line 2632; and pin $\overline{\text{WR}}$ connects via line 2633, with
8 29-U4.

10 Example VII

11 As an example pursuant to FIGS. 6-16, a signature pad may
12 have the configuration for interfitting in a receptacle. The
13 printed circuit boards 562 and 570 could be consolidated into a
14 single printed circuit board underlying the signature pad and
15 having comparable dimensions, e.g. about two inches by three
16 inches. The inputs and outputs from the consolidated circuit
17 board could comprise MBATS, GND, EXT EN, and the communication
18 lines for two-way alternate point-to-point communication. These
19 inputs and outputs could couple with a module at a region using
20 mating surface contacts.

21 Battery power could be available in the receiving module,
22 and protocol conversion and other functions of the terminal could
23 be performed by a modular processor. A touch screen could be
24 included at the three margins of the signature pad at the top
25 surfaces of the module.

26 By way of example, signatures as digitized by means of the
27 signature pad module could be transferred under the control of a

1 processor module to a data storage card inserted in a slot.
2 Alignment pegs such as 563, 564, FIG. 7, could form part of the
3 signature pad module, such that a touch screen would be
4 accessible to activate the signature pad module by transmitting
5 EXT EN to the pad module in response to actuation of a region of
6 the touch screen in signature capture mode.

7 Such touch screen would then signal when a signature had
8 been properly digitized and stored. The touch screen associated
9 with the module can accommodate the entire data capture command
10 set.

11 Example VIII (FIGS. 17 and 18)

12 In Example VIII, the circuitry of FIGS. 11-16 may be part of
13 a computerized processing module 3000, FIG. 17. A receiving
14 module 3010 may receive the module 3000 and may have coupling
15 means for engagement with cooperating connection means 3001 of
16 module 3000.

17 In this Example VIII, the receiving module 3010 may perform
18 the functions of data entry terminal 510, FIG 6, and may provide
19 battery means 3002 capable of providing for battery operation of
20 the circuitry of FIGS. 11-16. In particular, receiving module
21 3010 would have coupling means for automatically engaging with
22 the connection means 3001 as module 3000 is inserted into a
23 receptacle 3011 of module 3010. The coupling means and connection
24 means 3001 could also provide automatically completed signal
25 communication paths such as provided by the terminal connector
26 automatically mating with connector 528, FIG. 10, during assembly
27 of parts 510 and 516, FIG. 6. The module 3010 may have ledges

1 such as 3012 for overlying the side edges of the module 3000, and
2 may include segmental spherical detents such as 3014 which are
3 spring urged into receptacle 3011 to retain the module 3000
4 therein. A notch 3015 may facilitate removal of the complete
5 module 3000 as a unit from the receptacle 3011.

6 The module 3010 may have a touch screen 3020. One of the
7 touch switch positions may be "Signature Input Mode" as indicated
8 at 3021. When this mode is selected by manually depressing region
9 3021, a graphic display is produced on module 3000 as indicated
10 in FIG. 17 which facilitates the handwritten entry of a signature
11 e.g. in a space indicated by a box displayed at 3022 with a
12 signature line at 3023, and a "start" box indicated by a dash
13 line 3024.

14 Module 3000 may include a digitizer input screen 3025 over
15 substantially its entire length and width as viewed in FIG. 17,
16 and a graphic display e.g. of the dot matrix type may underlie
17 the digitizer screen and have a resolution sufficient to
18 accurately display handwritten data such as signatures and the
19 like, as well as indicia such as 3022, 3023, and 3024.

20 Where the signature is to be entered directly on the
21 digitizer screen 3025, a wooden stylus is conveniently used. In
22 this event, the display means of module 3000 may display the mode
23 at 3028 and suitable instructions at 3029.

24 Where a form with feed holes is to be engaged with pegs
25 3030, 3031 on module 3010, the form may have printed thereon
26 indicia such as 3022, 3023, 3024, "start", and 3029. In this
27 case, a conventional ball point pen may be used to enter the

1 signature on the form, and to apply a corresponding impression to
2 the digitizer input screen 3025 of FIG. 17.

3 By way of example, the computerized processing module 3000,
4 or a data storage card such as indicated at 3040 (inserted into a
5 slot) may store the authorized signatures of persons empowered to
6 approve a given transaction. Thus, a person delivering goods to
7 various establishments may download authorized signatures for a
8 given delivery into the module 3000 just prior to making the
9 delivery, or may select a respective data storage card 3040 from
10 a file thereof.

11 After the signature impression such as 3041 has been entered
12 in space 3022 of the digitizer input screen, the processor of
13 module 3000 or a processor 3042 of module 3010 may carry out a
14 comparison of the signature impression 3041 with the stored
15 authorized signatures. If there is a sufficient match with an
16 authorized signature the graphical display may indicate that the
17 signature was a valid authorized signature as at 3044, FIG. 18.
18 The matching authorized signature of record may be displayed in
19 space 3045, FIG. 18, or the name represented by the signature may
20 be simply printed in space 3045. A transaction number may be
21 assigned as indicated at 3046. Further, the signature 3047
22 corresponding to impression 3041, as stored by module 3000,
23 module 3010 or storage card 3040 may be displayed at a region
24 3049 adjacent region 3045 so that the operator can confirm the
25 matching condition, or actually make the decision as to whether
26 the signature is to be accepted. Of course, the signature as
27 entered may be stored in fully digitized form or in a suitably

1 compacted form in module 3000, module 3010 or storage card 3049.

2 Description of Example IX

3 Example VIII could be applied to the embodiment of FIGS. 6-
4 16 as a further example, in which case the resistive type
5 digitizer screen 520 could be used for the direct entry of a
6 signature e.g. using a passive wooden stylus, and display 514
7 could provide a resultant display such as indicated in FIG. 18,
8 and could display indicia such as 3028 and 3029, prior to entry
9 of the signature impression 3041. The signature comparison
10 program, and the set of authorized signatures could then be
11 downloaded into the data terminal 510, e.g. via connectors 534
12 and 528 from a data storage system within a delivery vehicle or
13 the like. Reference may be made to U.S. Patent 4,798,919 which
14 teaches using the sensing of pressure applied across the
15 signature as a further parameter for use in signature
16 verification.

17 Summary Re Examples VIII and IX

18 In examples VIII and IX, computerized processing module 3000
19 provides for the computerized processing and storage of data as
20 described in detail in reference to FIGS. 6-16. The stored data
21 e.g. complete digitized information concerning a signature
22 impression 3041 may be transmitted from random access storage
23 such as indicated at 29-U4 via connection means 3001 to an
24 external receiving module such as 3010 or 510, FIG. 6. The
25 computerized processing module 3000 could be of size to fit in a
26 shirt pocket as with module 516, FIG. 6, e.g. a cross sectional
27 perimeter of not more than about eight inches and a length

1 dimension of not more than about five inches.

2 The connection means 3001 of module 3000 automatically
3 engages with the coupling means in receptacle 3011 as the module
4 3000 is inserted over detents 3014 and under ledges 3012 to
5 assemble the module 3000 with the receiving module 3010.
6 Correspondingly, the connection means 3001 is automatically
7 disengaged from the coupling means as the module 3000 is removed
8 as a unit from receptacle 3011 (e.g. with the use of one finger
9 inserted into notch 3015).

10 The digitizer input screen 3025 is transparent so that the
11 matrix type display there beneath is visible to the user through
12 the digitizer screen. Any of the digitizer technologies currently
13 available such as those referred to herein may be utilized. Both
14 the digitizer input and the graphical display of module 3000 have
15 a resolution to accurately record and display handwritten
16 characters such as represented by signatures 3041, 3045 and 3047.
17 The data such as signatures stored in module 3000 in complete
18 digitized form or in compacted form may be transmitted to the
19 coupling means of receiving module 3010 for utilization
20 externally of module 3000. For example, receiving module 3010 may
21 have a programmed processor at 3042 for comparing a signature
22 impression data relating to a signature impression 3041 with a
23 set of authorized signatures stored on a data storage card 3040.

24 The display of module 3000 may display indicia such as 3022,
25 3023, and 3024 for facilitating input of a signature impression
26 such as 3041 directly on the digitizer input screen 3025, or a
27 form may be located e.g. by pegs 3030, 3031 and itself have
28

1 | indicia printed thereon. In Example IX, a conventional display
2 | screen at 514, FIG. 6, of a receiving module 510, may display
3 | instructions adjacent a digitizer screen at 520, and may provide
4 | a display such as indicated in FIG. 18, once a signature
5 | impression at 520 has been compared with a set of authorized
6 | signatures stored by the receiving module 510, FIG. 6.

7 | Although the invention has been described in connection with
8 | certain preferred embodiments thereof, it would be evident to
9 | those skilled in the art that various revisions and modifications
10 | to the preferred embodiment, as well as additional applications
11 | to those described by way of example herein can be made without
12 | departing from the spirit and scope of the invention. It is our
13 | intention however that all such revisions and modifications that
14 | may be obvious to those skilled in the art will be included
15 | within the scope of the following claims.

INCORPORATION BY REFERENCE

The present application hereby incorporates by reference the following US patents in their entirety including drawings and appendices and incorporated material:

US Patents 4,877,949, 5,019,699, 5,227,614, 5,410,141, 5,468,947, and 5,834,753.